

AMENDMENTS TO THE CLAIMS

Claim 1 (Currently Amended): A multilayer thin film formed on an Si substrate by epitaxial growth, the multilayer thin film comprising:

a buffer layer formed on said Si substrate, where said buffer layer includes

an oxide thin film of zirconium or of a rare earth element on said Si substrate;

a first perovskite layer oxide thin film on said oxide thin film; and

an electrically conductive thin film on said first perovskite layer oxide thin film,

a second perovskite oxide thin film formed on said buffer layer, where said second perovskite oxide thin film has a (100) or (001) orientation, and

a ferroelectric thin film, which is not the second perovskite oxide thin film, that is epitaxially grown on said second perovskite oxide thin film.

Claim 2 (Currently Amended): The multilayer thin film of claim 1, wherein said second perovskite oxide thin film has insulating properties.

Claim 3 (Canceled)

Claim 4 (Currently Amended): The multilayer thin film of claim 1, wherein said second perovskite oxide thin film comprises PbTiO_3 .

Claim 5 (Previously Presented): The multilayer thin film of claim 1, wherein said ferroelectric thin film comprises PZT.

Claim 6 (Original): An electron device comprising a multilayer thin film as recited in claim 1.

Claim 7 (Previously Presented): A process for preparing the multilayer thin film of claim 1, comprising:

forming a buffer layer including an oxide thin film of zirconium or of a rare earth element on an Si (100) substrate,

epitaxially growing a perovskite oxide thin film having a (100) or (001) orientation on said buffer layer, and

epitaxially growing a ferroelectric thin film on said perovskite oxide thin film.

Claim 8 (Previously Presented): The multilayer thin film of claim 1, wherein said buffer layer comprises ZrO_2 .

Claim 9 (Previously Presented): The multilayer thin film of claim 1, wherein said buffer layer comprises Y_2O_3 .

SUPPORT FOR THE AMENDMENT

This Amendment amends Claims 1-2 and 4. Support for the amendments is found in the specification and claims as originally filed. In particular, support for the limitation "a ferroelectric thin film, which is not the second perovskite oxide thin film" is implicit in the Claim 1 features of "a perovskite oxide thin film formed on said buffer layer" and "a ferroelectric thin film epitaxially grown on said perovskite oxide thin film". No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-2 and 4-9 will be pending in this application. Claim 1 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the courtesies extended to their representative during the November 14, 2003, personal interview.

As discussed at the interview, the present invention provides a multilayer thin film including a ferroelectric thin film having improved properties as a result of being epitaxially grown on a primer layer of a perovskite oxide thin film having a (100) or (001) orientation that is grown on a buffer layer on a silicon substrate. See, e.g., specification at page 4, lines 13-16 and 25-30; page 5, lines 18-19. The specification at Example 1 shows that ferroelectric PZT grown on a primer layer of the perovskite oxide PbTiO_3 that is grown on a buffer layer ($\text{Pt/Y}_2\text{O}_3/\text{ZrO}_2$) on Si has an electromechanical coupling factor of $k^2 = 39\%$, while PZT grown directly on the buffer layer on Si without the primer layer of PbTiO_3 has an electromechanical coupling factor of only 33%, which is inferior to that obtained with the primer layer of PbTiO_3 . See, specification at page 24, lines 6-24.

Claims 1-2 and 4-8 are rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 5,801,105 ("Yano-105"). In addition, Claims 1-2 and 4-8 are rejected under 35 U.S.C. § 102(b) over JP 10-017394 ("Yano-394") (based on an English computer translation and an English abstract of Yano-394). Claims 1-2 and 4-8 are rejected under 35 U.S.C. § 102(b) over Yano-394 (where U.S. Patent No. 6,121,647 is used as an accurate translation of Yano-394). Claim 9 is rejected under 35 U.S.C. § 103(a) over Yano-105 or Yano-394 (where U.S. Patent No. 6,121,647 is used as an accurate translation of Yano-394) or Yano-394" (based on an English computer translation and an English abstract of Yano-394) in view of U.S. Patent No. 5,744,374 ("Moon") or U.S. Patent No. 5,834,803 ("Nashimoto").

The cited prior art discloses multilayers of a ferroelectric film grown directly on a buffer layer of Pt/BaTiO₃/ZrO₂ on a Si substrate.

However, the cited prior art fails to suggest a primer layer of a perovskite oxide thin film between the ferroelectric thin film and the buffer layer. Thus, the cited prior art fails to suggest the independent Claim 1 limitations of "a second perovskite oxide thin film formed on said buffer layer, ... , and a ferroelectric thin film, which is not the second perovskite oxide thin film, that is epitaxially grown on said second perovskite oxide thin film".

Because the cited prior art fails to suggest all the limitations of independent Claim 1, the prior art rejections should be withdrawn.

Claim 1 is rejected under 35 U.S.C. § 112, second paragraph. To obviate the rejection, Claim 1 is amended.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Norman F. Oblon
Attorney of Record
Registration No. 24,618

Corwin P. Umbach, Ph.D.
Registration No. 40,211

Customer Number

22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/03)
NFO:CPU/bu